

What is Claimed is:

1. A method for detecting DNA, comprising the steps of:

(a) immobilizing a probe DNA on a chip;

(b) placing a target DNA on the chip having the probe DNA immobilized thereon, for

5 hybridization of the probe DNA and the target DNA;

(c) intercalating an intercalator to the hybridized DNA;

(d) introducing an electrochemiluminescent reaction fluid into the chip having the  
DNA with an intercalated intercalator;

(e) applying a preset voltage to the chip for causing reaction between the intercalator  
and the electrochemiluminescent reaction fluid; and,

(f) detecting, and analyzing a light from the reaction.

2. A method as claimed in claim 1, wherein the step (a) includes the steps of;

washing an electrode formed on the chip for the first time,

15 dipping the electrode in a mixed solution containing the probe DNA, and

washing the electrode for the second time for immobilizing the probe DNA on the  
electrode.

3. A method as claimed in claim 2, wherein the first time washing includes the steps

20 of dipping of the electrode in piranha solution and water in succession, the mixed solution  
containing the probe DNA and  $\omega$ -hydroxy-undecanethiol 3, or 3-mercaptopropionic acid are  
dissolved in an ethanol/octane mixed solvent, and the second time washing includes the steps  
of washing in ethanol and water.

4. A method as claimed in claim 2, wherein the electrode is formed of gold, the chip is formed of silicon, borosilicate glass, or PCB, and the probe DNA has a thiol functional group at a 5'-phosphate position.

5 5. A method as claimed in claim 1, wherein the intercalator is one selected from daunorubicin, nogalamycin, doxorubicin, and DAPI(4',6-diamidino-2-phenylindole), or, one selected from a material obtained by bonding proline, oxalic acid, or TPA (tripropylamine) with Hoechst 33258, quinacrine, or acridine orange.

10 6. A method as claimed in claim 1, wherein the electrochemiluminescent reaction fluid is one selected from Tris(2,2'-bipyridyl)ruthenium(II)[Ru(bpy)<sub>3</sub><sup>2+</sup>] , Tris(2,2'-bipyridyl)osmium(II)[Os(bpy)<sub>3</sub><sup>2+</sup>] and Tris(1,10-phenanthroline) ruthenium(II) [Ru(phen)<sub>3</sub><sup>2+</sup>].

15 7. A method as claimed in claim 1, wherein the step (b) includes the steps of;  
placing the target DNA on the chip having the probe DNA immobilized thereon;  
applying a first voltage to the chip for hybridizing the probe DNA and the target DNA, and  
applying a second voltage to the chip for removing not hybridized remained DNAs.

20 8. A method as claimed in claim 1, wherein the step (c) further includes the steps of washing the intercalators not fixed to the hybridized DNA with a buffer solution.

9. A method as claimed in claim 1, wherein the preset voltage in the step (e) is 0.5-

1.20V.

10. A device for detecting a DNA comprising:

a fastening part for fastening a DNA chip having a plurality of probe DNAs different from one another on an electrode;

a sample supplying part for supplying sample introduced for detecting a desired DNA from the DNA chip;

an injecting part for injecting the sample supplied from the sample supplying part to the DNA chip;

a power source part for applying a voltage to the electrode of the DNA so that the DNA makes reaction with the sample to cause electrochemiluminescence;

an optical detection part for detecting a light of the electrochemiluminescence to analyze the DNA; and

a discarding part for discarding unnecessary sample from the sample supplied to the DNA chip.

11. A device as claimed in claim 10, wherein the sample supplying part includes a electrochemiluminescent reaction fluid supplying part for supplying electrochemiluminescent reaction fluid, such as Tris(2.2'-bipyridyl)ruthenium(II)  $[\text{Ru}(\text{bpy})_3^{2+}]$ , Tris(2.2'-bipyridyl)osmium(II)  $[\text{Os}(\text{bpy})_3^{2+}]$ , a buffer solution supplying part, an intercalator supplying part, and a target DNA supplying part.

12. A device as claimed in claim 11, wherein the target DNA supplying part further includes a heater for heating the DNA double strand for denature the DNA double strand.

13. A device as claimed in claim 10, wherein the injecting part is a precision pump, or a dispenser, the power source part is potentiostat, the optical detection part is one selected from a photomultiplier tube (PMT), an avalanche photodiode, and a cooled CCD camera.

5

~~14.~~ A device for detecting a DNA comprising:

a working mounter for fastening, and mounting a DNA chip having probe DNAs arranged thereon on an electrode;

a sample reservoir for storage sample introduced for detecting a desired DNA from the DNA chip;

a first driving part for moving the working mounter to the sample reservoir for dipping the DNA chip mounted on the working mounter in the sample;

a second driving part for moving the sample reservoir for dipping the DNA chip mounted on the working mounter in a desired sample;

a power source part for applying a voltage to the electrode of the DNA chip so that the DNA makes reaction with the sample to cause electrochemiluminescence; and,

an optical detection part for detecting a light of the electrochemiluminescence to analyze the DNA.

15. A device as claimed in claim 14, wherein the working mounter includes;

a central part having the DNA chip mounted thereon, the DNA with a plurality of probe DNAs different from one another mounted thereon,

a reference electrode on one side of the DNA chip, and

a counter electrode on the other side of the DNA chip.

16. A device as claimed in claim 14, wherein the working mounter includes;  
a central part having one DNA chip mounted thereon, the DNA with a plurality of  
probe DNAs different from one another mounted thereon,

5 a reference electrode formed projected from one side of the DNA chip, and  
a counter electrode formed projected from the other side of the DNA chip.

17. A device as claimed in claim 14, wherein the first driving part is an actuator, and  
the second driving part is a servo motor, or a step motor.

18. A device as claimed in claim 14, wherein the sample reservoir includes;  
an electrochemiluminescent reaction fluid reservoir for supplying  
electrochemiluminescent reaction fluid, such as Tris(2,2'-bipyridyl)ruthenium(II)  $[\text{Ru}(\text{bpy})_3^{2+}]$ ,  
Tris(2,2'-bipyridyl)osmium(II)  $[\text{Os}(\text{bpy})_3^{2+}]$ , and Tris(1,10-phenanthroline) ruthenium(II)  
15  $[\text{Ru}(\text{phen})_3^{2+}]$ , a buffer solution reservoir, an intercalator reservoir, a target DNA reservoir,  
and a washing fluid reservoir.

19. A device as claimed in claim 14, wherein the optical detection part is one selected  
from a photomultiplier tube (PMT), an avalanche photodiode, and a cooled CCD camera.

20. A device as claimed in claim 14, wherein the sample reservoir and the working  
mounter have the same shape.